Name:

at1117paper: Complete the Square (v316)

Example

A square's edge length is x feet. A rectangle has a height of x feet and a width of 48 feet. Their combined area, found by adding the square's area and the rectangle's area, is 1273 square feet. What is the value of x?

Example's Solution

$$x^2 + 48x = 1273$$

To complete the square, add $\left(\frac{48}{2}\right)^2 = 576$ to both sides.

$$x^2 + 48x + 576 = 1849$$

Recognize the left side is now a perfect-square trinomial. Factor the left side.

$$(x + 24)^2 = 1849$$

Undo the squaring.

$$x + 24 = \pm\sqrt{1849}$$

$$x + 24 = \pm 43$$

Subtract 24 from both sides.

$$x = -24 \pm 43$$

In this geometric example, we are only concerned about the positive solution. So,

$$x = 19$$

Question 1

A square's edge length is x feet. A rectangle has a height of x feet and a width of 58 feet. The total area, of the square and rectangle, is 840 square feet. What is the value of x?

$$x^2 + 58x = 840$$

$$x^2 + 58x + 841 = 1681$$

$$(x + 29)^2 = 1681$$

$$x + 29 = \pm 41$$

$$x = 12$$

Question 2

A square's edge length is x feet. A rectangle has a height of x feet and a width of 56 feet. The total area, of the square and rectangle, is 1152 square feet. What is the value of x?

$$x^2 + 56x = 1152$$
$$x^2 + 56x + 784 = 1936$$
$$(x + 28)^2 = 1936$$
$$x + 28 = \pm 44$$
$$x = 16$$

Question 3

A square's edge length is x feet. A rectangle has a height of x feet and a width of 60 feet. The total area, of the square and rectangle, is 2236 square feet. What is the value of x?

$$x^2 + 60x = 2236$$
$$x^2 + 60x + 900 = 3136$$
$$(x + 30)^2 = 3136$$
$$x + 30 = \pm 56$$
$$x = 26$$